MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

TRM2191 – RESOURCE MANAGEMENT TECHNIQUES

(All sections / Groups)

08 OCTOBER 2016
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 5 printed pages (including cover page).
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

You are required to answer ALL FOUR (4) questions.
Show necessary steps to support your answer.

QUESTION 1 (10 MARKS)

(a) *Len Furniture* produces two types of wall shelves. A type X shelf nets the manufacturer a profit of RM200, and each type Y shelf yields a RM260 profit. During any given production period of one week, 5 gallons of varnish and 170 lengths of wood are available. Each type X shelf requires approximately 0.1 gallon of varnish and 2 lengths of wood. Each type Y shelf takes 0.15 gallon of varnish and 3 lengths of wood. The firm must produce both types of shelves every week where at least 40% of the total production must be type X shelves.

Assuming that everything produced can be sold, formulate a Linear Programming model to determine how many type X and type Y shelves that the manufacturer should produce to obtain optimal profit per production period.

[3 marks]

(b) Use the simplex method to find the optimal solution to the following problem:

Maximize $Z = 5x_1 + 6x_2$

Subject to: $2x_1 + x_2 \leq 120$
$2x_1 + 3x_2 \leq 240$
$x_1, x_2 \geq 0$

[3 marks]

(c) Consider the following Linear Programming (LP) problem:

Minimize $Z = 4x_1 + 3x_2$
Subject to: $2x_1 + 3x_2 \geq 60$
$2x_1 + 2x_2 \leq 48$
$x_1, x_2 \geq 0$

(i) Graphically solve the LP problem (use the graph paper provided) by showing the feasible region.
(ii) Find the optimal solution.

[2.5+1.5=4 marks]

Continued ...

QUESTION 2 (10 MARKS)

(a) The table below shows the cost for shipping craft products from three local craft centres to three distributors.

	Distribution cost			
Craft centres	**Distributor 1**	**Distributor 2**	**Distributor 3**	**Supply**
C1	5	7	8	20
C2	3	9	9	65
C3	4	9	6	90
Demand	30	40	85	

(i) Determine whether the problem is a balanced transportation problem. State your reason (no more than 10 number of words).

(ii) Find the initial basic solution using North West Corner method.

(iii) For your answer in (ii), determine whether the solution is optimal. State your reason (no more than 10 number of words).

[1+2.5+1.5=5 marks]

(b) A sale manager of a multinational company must assign four executives to manage events at four different regions: I, II, III and IV. The executives are all equally qualified so the decision will be based on the costs of travelling. The travelling cost (in units of RM1000) is given in the following table.

	Travelling cost (RM1000)			
Executives	**I**	**II**	**III**	**IV**
A	14	5	8	7
B	2	12	6	5
C	7	8	3	9
D	2	4	6	10

(i) Use the Hungarian algorithm to determine the assignment of the executives to the tasks at different locations that minimize the travelling costs.

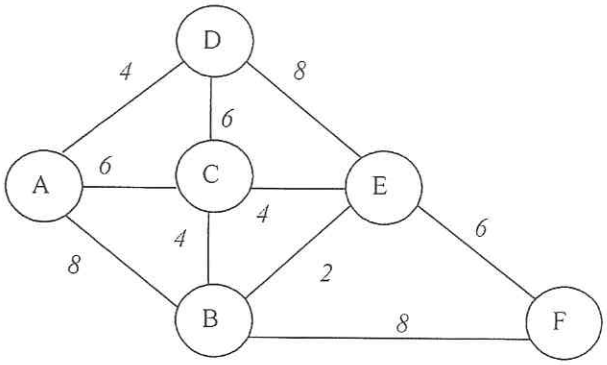
(ii) Calculate the travelling cost.

[4+1=5 marks]

Continued ...

QUESTION 3 (10 MARKS)

(a) A telecommunication company is operating at several locations in a country. The company has six base stations: A, B, C, D, E and F. The distances (in hundred kilometres) among the base stations are given in the figure below.



(i) Determine the minimal spanning tree of the network that connects all the base stations.

(ii) Calculate the total distance of the minimal spanning tree.

[3+1=4 marks]

(b) The table below shows a list of activities that are involved in a project.

Activity	Predecessor(s)	Duration (weeks)
A	-	3
B	-	2
C	A	4
D	B, C	5
E	D	5
F	B, C	2
G	E	1
H	F, G	6
I	B, C	10

(i) Develop a project network based on the given information.

(ii) Determine the earliest and latest activity times for each activity.

(iii) Find the critical path and duration for the project.

(iv) What happen to the project completion time if the duration of activity *G* increases by 2 weeks?

[2+2+1+1=6 marks]

Continued ...

QUESTION 4 (10 MARKS)

(a) The *RightBurger* orders ground meat every week to cover its weekly demand of 40kg. The fixed cost per order is RM10. It cost about RM0.08 per kg per week to refrigerate and store the meat. Assume that demand occurs at a constant rate and zero lead time between the placement and receipt of an order.

(i) Determine the optimal ordering policy for ordering the meat.

(ii) Find the weekly inventory cost associated with the proposed policy.

[2+1=3 marks]

(b) Given the following non-linear programming problem:

Minimize $f(x_1, x_2) = 2{x_1}^2 + {x_2}^2$

Subject to: $x_1 + x_2 = 1$

$x_1, x_2 \geq 0$

(i) Find the optimal solution using the Lagrangian Multipliers method.

(ii) Calculate the optimal value of f.

(iii) Use the Hessian matrix of $f(x_1, x_2)$ to prove that the optimal solution minimizes f.

[4+1+2=7 marks]

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